

**Amendments to the Claims:**

This listing of claims will replace all prior versions, and listings, of claims in the application:

**Listing of Claims:**

1           Claim 1   (Currently amended):   An acceleration  
2       sensor for detecting an acceleration caused by an object  
3       oscillated in an oscillation direction, comprising:  
4           a sensor casing having a center axis and to be  
5       positioned in coaxial alignment with said oscillation  
6       direction to receive said acceleration, said sensor  
7       casing having first and second circular inner surfaces  
8       opposing to and spaced apart along said center axis from  
9       each other at a first space distance less than 8.59mm,  
10      and a third cylindrical inner surface connected at one  
11      end with said first inner surface and at the other end  
12      with said second inner surface to define a cylindrical  
13      closed space;  
14           an oscillation plate accommodated in said closed  
15      space of said sensor casing and having a central portion  
16      securely supported by said sensor casing and a peripheral  
17      portion integrally formed with said central portion and  
18      extending radially outwardly of said central portion to  
19      be freely movable with respect to said sensor casing,  
20      said oscillation plate having a peripheral end surface  
21      spaced apart from said third inner surface of said sensor

22 casing at an annular gap small enough to enable said  
23 oscillation plate to oscillate with respect to said  
24 sensor casing, said oscillation plate having a first flat  
25 surface opposing to and spaced apart along said center  
26 axis from said first inner surface of said sensor casing  
27 at a second space distance, and a second flat surface  
28 opposing to and spaced apart along said center axis from  
29 said second inner surface of said sensor casing at a  
30 third space distance, said oscillation plate being partly  
31 oscillatable along said center axis with respect to said  
32 sensor casing; and

33 a piezoelectric element having first and second  
34 surfaces and provided on at least one of said first and  
35 second flat surfaces of said oscillation plate to  
36 generate a voltage indicative of said acceleration when  
37 said acceleration is exerted on said sensor casing to  
38 have said oscillation plate partly oscillated along said  
39 center axis with respect to said sensor casing with said  
40 peripheral portion of said oscillation plate being  
41 deformed; in which said ~~first~~ second space distance is  
42 less than or equal to the diameter of said third inner  
43 surface of said sensor casing multiplied by 0.1.

1 Claim 2 (Original): An acceleration sensor as set  
2 forth in claim 1, in which said sensor casing has a

3 supporting portion projecting from said first inner  
4 surface toward said second inner surface to support said  
5 oscillation plate, said piezoelectric element being  
6 provided on said second flat surface of said oscillation  
7 plate and opposing to and spaced apart along said center  
8 axis from said second inner surface of said sensor casing  
9 at a fourth space distance, in which said second space  
10 distance is less than or equal to the diameter of said  
11 third inner surface of said sensor casing multiplied by  
12 0.1, and in which said fourth space distance is less than  
13 or equal to the diameter of said third inner surface of  
14 said sensor casing multiplied by 0.1.

1 Claim 3 (Original): An acceleration sensor as set  
2 forth in claim 1, in which said sensor casing has a  
3 supporting portion projecting from said first inner  
4 surface toward said second inner surface to support said  
5 oscillation plate, said piezoelectric element being  
6 provided on said first flat surface of said oscillation  
7 plate and opposing to and spaced apart along said center  
8 axis from said first inner surface of said sensor casing  
9 at a fifth space distance, in which said third space  
10 distance is less than or equal to the diameter of said  
11 third inner surface of said sensor casing multiplied by  
12 0.1, and in which said fifth space distance is less than

13 or equal to the diameter of said third inner surface of  
14 said sensor casing multiplied by 0.1.

1 Claim 4 (Original): An acceleration sensor as set  
2 forth in claim 1, in which said sensor casing has a  
3 supporting portion projecting from said second inner  
4 surface toward said first inner surface to support said  
5 oscillation plate, said piezoelectric element being  
6 provided on said first flat surface of said oscillation  
7 plate and opposing to and spaced apart along said center  
8 axis from said first inner surface of said sensor casing  
9 at a sixth space distance, in which said third space  
10 distance is less than or equal to the diameter of said  
11 third inner surface of said sensor casing multiplied by  
12 0.1, and in which said sixth space distance is less than  
13 or equal to the diameter of said third inner surface of  
14 said sensor casing multiplied by 0.1.

1 Claim 5 (Original): An acceleration sensor as set  
2 forth in claim 1, in which said sensor casing has a  
3 supporting portion projecting from said second inner  
4 surface toward said first inner surface to support said  
5 oscillation plate, said piezoelectric element being  
6 provided on said second flat surface of said oscillation  
7 plate and opposing to and spaced apart along said center

8 axis from said second inner surface of said sensor casing  
9 at a seventh space distance, in which said second space  
10 distance is less than or equal to the diameter of said  
11 third inner surface of said sensor casing multiplied by  
12 0.1, and in which said seventh space distance is less  
13 than or equal to the diameter of said third inner surface  
14 of said sensor casing multiplied by 0.1.

1 Claim 6 (Currently amended): An acceleration  
2 sensor for detecting an acceleration caused by an object  
3 oscillated in an oscillation direction, comprising:

4 a sensor casing having a center axis and to be  
5 positioned in coaxial alignment with said oscillation  
6 direction to receive said acceleration, said sensor  
7 casing having first and second circular inner surfaces  
8 opposing to and spaced apart along said center axis from  
9 each other at a first space distance less than 8.59mm,  
10 and a third cylindrical inner surface connected at one  
11 end with said first inner surface and at the other end  
12 with said second inner surface to define a cylindrical  
13 closed space;

14 an oscillation plate accommodated in said closed  
15 space of said sensor casing and having a central portion  
16 securely supported by said sensor casing and a peripheral  
17 portion integrally formed with said central portion and

18 extending radially outwardly of said central portion to  
19 be freely movable with respect to said sensor casing,  
20 said oscillation plate having a peripheral end surface  
21 spaced apart from said third inner surface of said sensor  
22 casing at an annular gap small enough to enable said  
23 oscillation plate to oscillate with respect to said  
24 sensor casing, said oscillation plate having a first flat  
25 surface opposing to and spaced apart along said center  
26 axis from said first inner surface of said sensor casing  
27 at a second space distance, and a second flat surface  
28 opposing to and spaced apart along said center axis from  
29 said second inner surface of said sensor casing at a  
30 third space distance, said oscillation plate being partly  
31 oscillatable along said center axis with respect to said  
32 sensor casing;

33 a first piezoelectric element having first and  
34 second surfaces and provided on said first flat surface  
35 of said oscillation plate to generate a voltage  
36 indicative of said acceleration when said acceleration is  
37 exerted on said sensor casing to have said oscillation  
38 plate partly oscillated along said center axis with  
39 respect to said sensor casing with said peripheral  
40 portion of said oscillation plate being deformed; and

41 a second piezoelectric element having first and  
42 second surfaces and provided on said second flat surface

43 of said oscillation plate to generate a voltage  
44 indicative of said acceleration when said acceleration is  
45 exerted on said sensor casing to have said oscillation  
46 plate partly oscillated along said center axis with  
47 respect to said sensor casing with said peripheral  
48 portion of said oscillation plate being deformed; in  
49 which said ~~first~~ second space distance is less than or  
50 equal to the diameter of said third inner surface of said  
51 sensor casing multiplied by 0.1.

1 Claim 7 (Original): An acceleration sensor as set  
2 forth in claim 6, in which said sensor casing has a  
3 supporting portion projecting from said first inner  
4 surface toward said second inner surface to support said  
5 oscillation plate, said first piezoelectric element being  
6 provided on said first flat surface of said oscillation  
7 plate and opposing to and spaced apart along said center  
8 axis from said first inner surface of said sensor casing  
9 at a fourth space distance, said second piezoelectric  
10 element being provided on said second flat surface of  
11 said oscillation plate and opposing to and spaced apart  
12 along said center axis from said second inner surface of  
13 said sensor casing at a fifth space distance, in which  
14 said fourth space distance is less than or equal to the  
15 diameter of said third inner surface of said sensor

16 casing multiplied by 0.1, and in which said fifth space  
17 distance is less than or equal to the diameter of said  
18 third inner surface of said sensor casing multiplied by  
19 0.1.

1 Claim 8 (Original): An acceleration sensor as set  
2 forth in claim 6, in which said sensor casing has a  
3 supporting portion projecting from said second inner  
4 surface toward said first inner surface to support said  
5 oscillation plate, said first piezoelectric element being  
6 provided on said first flat surface of said oscillation  
7 plate and opposing to and spaced apart along said center  
8 axis from said first inner surface of said sensor casing  
9 at a sixth space distance, and said second piezoelectric  
10 element being provided on said second flat surface of  
11 said oscillation plate and opposing to and spaced apart  
12 along said center axis from said second inner surface of  
13 said sensor casing at a seventh space distance, in which  
14 said sixth space distance is less than or equal to the  
15 diameter of said third inner surface of said sensor  
16 casing multiplied by 0.1, and in which said seventh space  
17 distance is less than or equal to the diameter of said  
18 third inner surface of said sensor casing multiplied by  
19 0.1.

1           Claim 9 (Amended): An acceleration sensor for  
2     detecting an acceleration caused by an object oscillated  
3     in an oscillation direction, comprising:  
4           a sensor casing having a center axis and to be  
5     positioned in coaxial alignment with said oscillation  
6     direction to receive said acceleration, said sensor  
7     casing including a cylindrical fixed case member having a  
8     circular bottom portion having a first circular inner  
9     surface, a cylindrical side portion integrally formed  
10    with said bottom portion, and a supporting portion  
11    projecting from said bottom portion, and a cover member  
12    being provided on said fixed case member and having a  
13    circular cover portion having a second circular inner  
14    surface, and a cylindrical side portion integrally formed  
15    with said cover portion, said side portion of said fixed  
16    case member having a third cylindrical inner surface  
17    connected at one end with said first inner surface, said  
18    side portion of said cover member having a fourth  
19    cylindrical inner surface connected at one end with said  
20    second inner surface, said second inner surface of said  
21    cover portion of said cover member opposing to and spaced  
22    apart along said center axis from said first inner  
23    surface of said bottom portion of said fixed case member  
24    at a first space distance less than 8.59mm, said first  
25    inner surface of said bottom portion of said fixed case

26 member and said third inner surface of said side portion  
27 of said fixed case member, and said second inner surface  
28 of said cover portion of said cover member and said  
29 fourth inner surface of said side portion of said cover  
30 member collectively defining a cylindrical closed space;  
31 an oscillation plate accommodated in said closed  
32 space of said sensor casing and having a central portion  
33 securely supported by said supporting portion of said  
34 fixed case member of said sensor casing, and a peripheral  
35 portion integrally formed with said central portion and  
36 extending radially outwardly of said central portion to  
37 be freely movable with respect to said sensor casing,  
38 said oscillation plate having a peripheral end surface  
39 spaced apart from said third inner surface of said side  
40 portion of said fixed case member at an annular gap small  
41 enough to enable said oscillation plate to oscillate with  
42 respect to said sensor casing, said oscillation plate  
43 having a first flat surface opposing to and spaced apart  
44 along said center axis from said first inner surface of  
45 said bottom portion of said fixed case member at a second  
46 space distance, and a second flat surface opposing to and  
47 spaced apart along said center axis from said second  
48 inner surface of said cover portion of said cover member  
49 at a third space distance, said oscillation plate being  
50 partly oscillatable along said center axis with respect

51 to said sensor casing; and  
52 a piezoelectric element having a first surface held  
53 in contact with said second flat surface of said  
54 oscillation plate, and a second surface opposing to and  
55 spaced apart along said center axis from said second  
56 inner surface of said cover portion of said cover member  
57 at a fourth space distance, said piezoelectric element  
58 being provided on said second flat surface of said  
59 oscillation plate in axial alignment with said  
60 oscillation plate to generate a voltage indicative of  
61 said acceleration when said acceleration is exerted on  
62 said sensor casing to have said oscillation plate partly  
63 oscillated along said center axis with respect to said  
64 sensor casing with said peripheral portion of said  
65 oscillation plate being deformed; in which said first  
66 space distance is less than or equal to the diameter of  
67 said third inner surface of said side portion of said  
68 fixed case member multiplied by 0.1, and in which said  
69 ~~first~~ second space distance is less than or equal to the  
70 diameter of said fourth inner surface of said side  
71 portion of said cover member multiplied by 0.1.

1 Claim 10 (Original): An acceleration sensor as set  
2 forth in claim 9, in which said second space distance is  
3 less than or equal to the diameter of said third inner

4 surface of said side portion of said fixed case member  
5 multiplied by 0.1, and in which said fourth space  
6 distance is less than or equal to the diameter of said  
7 third inner surface of said side portion of said fixed  
8 case member multiplied by 0.1.

1 Claim 11 (Original): An acceleration sensor as set  
2 forth in claim 9, in which said second space distance is  
3 less than or equal to the diameter of said fourth inner  
4 surface of said side portion of said cover member  
5 multiplied by 0.1, and in which said fourth space  
6 distance is less than or equal to the diameter of said  
7 fourth inner surface of said side portion of said cover  
8 member multiplied by 0.1.

1 Claim 12 (Original): An acceleration sensor as set  
2 forth in claim 9, in which said piezoelectric element is  
3 in the form of an annular shape and has said first  
4 surface held in contact with said second flat surface of  
5 said oscillation plate and having thereon a first  
6 electrode between said first surface of said  
7 piezoelectric element and said second flat surface of  
8 said oscillation plate, and said second surface opposing  
9 to said second inner surface of said cover portion of  
10 said cover member and having thereon a second electrode

11       opposing to said second inner surface of said cover  
12       portion of said cover member, and in which said first and  
13       second electrodes enable said voltage indicative of said  
14       acceleration to output therethrough.

1           Claim 13 (Original): An acceleration sensor as set  
2       forth in claim 9, in which said fixed case member is made  
3       of a metal, and said cover member is made of a plastic.

1           Claim 14 (Original): An acceleration sensor as set  
2       forth in claim 9, in which said side portion of said  
3       fixed case member has a first section close to said  
4       bottom portion of said fixed case member, a second  
5       section remote from said bottom portion of said fixed  
6       case member, and an annular ledge section formed between  
7       said first and second sections with an annular groove  
8       open toward said side portion of said cover member, in  
9       which the diameter of said first section of said side  
10      portion of said fixed case member is smaller than or  
11      equal to the diameter of said side portion of said cover  
12      member, and in which said side portion of said cover  
13      member is snugly received in said annular groove with a  
14      resilient ring intervening between said annular ledge  
15      section of said side portion of said fixed case member  
16      and said side portion of said cover member to

17 hermetically seal the gap between said annular ledge  
18 section of said side portion of said fixed case member  
19 and said side portion of said cover member.

1 Claim 15 (Original): An acceleration sensor as set  
2 forth in claim 9, which further comprises an output  
3 terminal pin mounted on said cover member and extending  
4 into said closed space to be electrically connected to  
5 said piezoelectric element, in which said output terminal  
6 pin has a terminal end portion projecting outwardly of  
7 said cover member and electrically connectable with an  
8 exterior coupling member to output said voltage  
9 indicative of said acceleration.

1 Claim 16 (Original): An acceleration sensor as set  
2 forth in claim 9, in which said fixed case member has a  
3 screw portion to be screwed to said object which is to  
4 receive said acceleration.

1 Claim 17 (Original): An acceleration sensor as set  
2 forth in claim 9, in which said supporting portion of  
3 said fixed case member projects toward said cover portion  
4 of said cover member and is tapered toward said  
5 oscillation plate.

1           Claim 18 (Currently amended): An acceleration  
2       sensor for detecting an acceleration caused by an object  
3       oscillated in an oscillation direction, comprising:  
4           a sensor casing having a center axis and to be  
5       positioned in coaxial alignment with said oscillation  
6       direction to receive said acceleration, said sensor  
7       casing including a cylindrical fixed case member having a  
8       circular bottom portion having a first circular inner  
9       surface, and a cylindrical side portion integrally formed  
10      with said bottom portion, said side portion of said fixed  
11      case member having a first section close to said bottom  
12      portion of said fixed case member, a second section  
13      remote from said bottom portion of said fixed case member  
14      and radially inwardly bent, and an annular ledge section  
15      formed between said first and second sections with an  
16      annular ledge, a metal base member having a circular base  
17      portion and a supporting portion, said base portion  
18      having a second circular inner surface and a circular  
19      outer surface, and said supporting portion projecting  
20      from said second inner surface, said base portion of said  
21      metal base member having a central section integrally  
22      formed with said supporting portion, and a peripheral  
23      section extending radially outwardly of said central  
24      section, said metal base member mounted on said annular  
25      ledge of said fixed case member with a resilient ring

26 intervening between said second section of said side  
27 portion of said fixed case member and said peripheral  
28 section of said base portion of said metal base member to  
29 hermetically seal the gap between said second section of  
30 said side portion of said fixed case member and said  
31 peripheral section of said base portion of said metal  
32 base member, said first section of said side portion of  
33 said fixed case member having a third cylindrical inner  
34 surface connected at one end with said first inner  
35 surface of said bottom portion of said fixed case member  
36 and at the other end with said second inner surface of  
37 said base portion of said metal base member, said second  
38 inner surface of said base portion of said metal base  
39 member opposing to and spaced apart along said center  
40 axis from said first inner surface of said bottom portion  
41 of said fixed case member at a first space distance less  
42 than 8.59mm, and a cover member being provided on said  
43 outer surface of said metal base member and having a  
44 peripheral section firmly engaged with said second  
45 section of said side portion of said fixed case member,  
46 said first inner surface of said bottom portion of said  
47 fixed case member, said second inner surface of said base  
48 portion of said metal base member, and said third inner  
49 surface of said first section of said side portion of

said fixed case member collectively defining a  
cylindrical closed space;

an oscillation plate accommodated in said closed space  
of said sensor casing and having a central portion securely  
supported by said supporting portion of said metal base  
member of said sensor casing, and a peripheral portion  
integrally formed with said central portion and extending  
radially outwardly of said central portion to be freely  
movable with respect to said sensor casing, said  
oscillation plate having a peripheral end surface spaced  
apart from said third inner surface of said first section  
of said side portion of said fixed case member at an  
annular gap small enough to enable said oscillation plate  
to oscillate with respect to said sensor casing, said  
oscillation plate having a first flat surface opposing to  
and spaced apart along said center axis from said first  
inner surface of said bottom portion of said fixed case  
member at a second space distance, and a second flat  
surface opposing to and spaced apart along said center axis  
from said second inner surface of said base portion of said  
metal base member at a third space distance, said  
oscillation plate being partly oscillatable along said  
center axis with respect to said sensor casing; and

a piezoelectric element having a first surface  
opposing to and spaced apart along said center axis from

75        said first inner surface of said bottom portion of said  
76        fixed case member at a fourth space distance, and a  
77        second surface held in contact with said first flat  
78        surface of said oscillation plate, said piezoelectric  
79        element being provided on said first flat surface of said  
80        oscillation plate in axial alignment with said  
81        oscillation plate to generate a voltage indicative of  
82        said acceleration when said acceleration is exerted on  
83        said sensor casing to have said oscillation plate partly  
84        oscillated along said center axis with respect to said  
85        sensor casing with said peripheral portion of said  
86        oscillation plate being deformed; in which said ~~first~~  
87        second space distance is less than or equal to the  
88        diameter of said third inner surface of said first  
89        section of said side portion of said fixed case member  
90        multiplied by 0.1.

1            Claim 19 (Original): An acceleration sensor as set  
2        forth in claim 18, in which said third space distance is  
3        less than or equal to the diameter of said third inner  
4        surface of said first section of said side portion of  
5        said fixed case member multiplied by 0.1, and in which  
6        said fourth space distance is less than or equal to the  
7        diameter of said third inner surface of said first

8 section of said side portion of said fixed case member  
9 multiplied by 0.1.

1 Claim 20 (Original): An acceleration sensor as set  
2 forth in claim 18, in which said piezoelectric element is  
3 in the form of an annular shape and has said first  
4 surface opposing to said first inner surface of said  
5 bottom portion of said fixed case member and having  
6 thereon a first electrode opposing to said first inner  
7 surface of said bottom portion of said fixed case member,  
8 and said second surface held in contact with said first  
9 flat surface of said oscillation plate and having thereon  
10 a second electrode between said second surface of said  
11 piezoelectric element and said first flat surface of said  
12 oscillation plate, in which said first and second  
13 electrodes enable said voltage indicative of said  
14 acceleration to output therethrough.

1 Claim 21 (Original): An acceleration sensor as set  
2 forth in claim 18, in which said fixed case member and  
3 said metal base member are made of a metal, and said  
4 cover member is made of a plastic.

1 Claim 22 (Original): An acceleration sensor as set  
2 forth in claim 18, which further comprises an output

3 terminal pin mounted on said cover member and partly  
4 extending through said cover member, said supporting  
5 portion of said metal base member, said oscillation  
6 plate, and said piezoelectric element into said closed  
7 space to be electrically connected to said piezoelectric  
8 element, in which said output terminal pin has a terminal  
9 end portion projecting outwardly of said cover member and  
10 electrically connectable with an exterior coupling member  
11 to output said voltage indicative of said acceleration.

1 Claim 23 (Original): An acceleration sensor as set  
2 forth in claim 18, in which said fixed case member has a  
3 screw portion to be screwed to said object which is to  
4 receive said acceleration.

1 Claim 24 (Original): An acceleration sensor as set  
2 forth in claim 18, in which said supporting portion of  
3 said metal base member projects toward said bottom  
4 portion of said fixed case member and is tapered toward  
5 said oscillation plate and formed with a through bore.

1 Claim 25 (Original): An acceleration sensor as set  
2 forth in claim 18, which further comprises a resilient  
3 metal plate in the form of a truncated cone shape and

4       having an open end electrically connectable with said  
5       piezoelectric element.

1           Claim 26 (Original): An acceleration sensor as set  
2       forth in claim 25, in which said bottom portion of said  
3       fixed case member is formed with a central cavity plate  
4       open toward said metal plate and in the form similar to  
5       said shape of said metal plate.

1           Claim 27 (Original): An acceleration sensor as set  
2       forth in claim 18, in which said oscillation plate has a  
3       central hole formed at the center portion thereof and  
4       open at said first and second flat surfaces, in which  
5       said piezoelectric element has a central hole formed at  
6       the center portion thereof and open at its first and  
7       second surfaces.

Claims 28-48 (Canceled)